



## CHAPTER 3

**Information Technology Revolution in the  
Republic of Korea: Socio-Economic  
Development Issues and Policymaking  
Challenges***Bruce P. Chadwick*

The worldwide explosion of information and communication technologies profoundly affected economic growth and society in the Republic of Korea in the 1990s and early 2000s. Among developing countries, South Korea was hardly alone in pursuing strategies to capitalize on ICTs as a potential motor of economic growth and, whatever the strains caused by the present slowdown in ICT industries as a whole, the Republic of Korea can largely be considered a success as a developing country that has harnessed ICTs for economic growth and social transformation. Many other developing countries – among them India, the Philippines, Jordan, Brazil, and Ghana – have tried to become world or regional sources of ICT products and services with varying degrees of success. The Republic of Korea's experience can shed some light on the important factors in ICT-based national development strategies, as well as illustrate the multifaceted way in which ICTs interact with economic and social objectives.

This chapter will help place the ongoing “Digital Revolution” in South Korea in perspective, drawing on the author’s experience with ICT applications in a wide variety of international development contexts. It will then discuss some of the dominant features of ICTs in the ROK’s economy. Next, it will turn to some of the economic governance issues related to ICTs in South Korea. Finally, it will look at some of the future developments and implications for both the ROK and other countries considering or engaged in ICT growth strategies.

### **Understanding the Digital Revolution**

Strictly speaking, information and communication technologies have existed for centuries, and have been important components of virtually all economic systems. What has changed in the last 10-50 years has been the development of techniques for managing, processing, and communicating *digital* information. With digital ICTs, information can be duplicated exactly at very low marginal cost and transmitted quickly over long distances at speeds unimaginably rapid when compared to previous methods. Moreover, since text, video, sound, software, and other digital elements can all be disaggregated into 0s and 1s, they can all be transmitted through more or less the same digital infrastructure. Thus, even while prices for telecommunications and many forms of IT are falling, the benefits of having access to them are increasing by leaps and bounds, improving the cost/benefit ratios and the attractiveness of ICT investments. Effective telecommunications and telecommunications policy has become even more critical to national development, since new and existing telecommunications investments will be able to deliver larger and larger amounts of economically valuable information and products critical to international competitiveness and domestic quality-of-life.

South Korea is particularly well suited to success in ICT-driven economic development. It has a relatively high GDP per capita (around US\$ 9000 in 2001, according to the World Bank), literacy rates of over 95%, openness to foreign trade, a liberalized telecommunications sector, a history of pro-active industrial policy, and a population of close to 50 million, 70% urbanized, all in a land area the size of Indiana. This means that the Republic of Korea has both foreign and domestic markets for ICT products and services, a population with some degree of disposable income, literate citizens capable both of using and finding uses for information technologies, as well as a business community engaged in global trade and exposed to evolving ICT business practices. Moreover, at the southern end of the peninsula and practically blocked to the north by a secretive, significantly poorer, and closed-off North Korea, South Korea is, in effect, a technological island, not unlike Japan, Taiwan, and Singapore, and thus faces similar needs for effective linkages to international business and foreign communities.

The effect of ICTs on national economies such as the ROK's is fourfold. ICTs and the digital revolution create:

- *New industries and economic sectors or sub-sectors* (e.g. the software industry, cell phones, computers and peripherals)
- *New ways of doing business* (e.g. e-commerce, globally distributed organizations, integrated supply chains)
- *New tasks and opportunities for government* (e.g. e-government, privacy policy legislation, ICT industrial policy)
- *New issues in economic and political development* (e.g. availability of information access, computer literacy, the digital divide)

Thus, the effect of ICTs and the digital revolution on economic growth, social capital, and political development in a country such as the ROK goes far beyond the contribution of the ICT sector to national GDP. ICTs affect the efficiency and productivity of other economic processes, the distribution of economic gains and basic services, and the transparency and accountability of the government.

Despite the recent slowdown in ICT industries worldwide, there is little doubt that the Internet and digital ICTs have changed the global business environment and are here to stay. Even with the industry consolidation presently underway, digital technologies and access to them is diffusing rapidly. The market research firm eTForecasts expects the number of world Internet users to reach one billion by 2005, which is triple the user base for 2000.<sup>47</sup> Korea's National Computerization Agency, an advisory organization to the ROK for e-government policies and technologies, reports 25 million South Korean Internet users in 2001, or just over 50% percent of the population. Perhaps the most interesting statistic is the population with broadband access – over 50% of households have access to broadband connections – making South Korea the world's leader in household broadband connectivity.<sup>48</sup>

South Korea's extensive participation in medium- and high-technology export markets, such as auto manufacture, domestic consumer equipment, cellular telephones, and computer peripherals, has meant that Korean businesses are increasingly interlinked to global production chains dependent on shared

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<sup>47</sup> ETForecast press release, "Internet users will surpass 1 billion in 2005." 6 February 2001. See eTForecast report from their website:

<http://www.etforecasts.com/pr/pr201.htm>

<sup>48</sup> Herz, J.C.. "The Bandwidth Capital of the World," *Wired Magazine*; October 2002.

product standards and interlocking inventories and data networks mediated by ICTs. These industries always were, but are becoming even more knowledge intensive -- dependent on rapid and accurate communication between business suppliers and consumers in global value chains to ensure that products arrive on time, to specification, and can change rapidly in response to new technologies, new demands, and new consumer tastes.

Access to knowledge is now a key factor in a country's economic competitiveness, and the Republic of Korea's tradition of proactive industrial policy means that the changes demanded by business deployment of ICTs are more likely to be planned for than resisted against, at least by management and policy makers. Businesses require knowledge of customer demands, tastes, and requirements to ensure traction for their products and adequate pricing margins available for supplying consumer needs successfully. Knowledge of and communication with a multiplicity of suppliers is critical for controlling costs, reducing inventory time, and speeding design modification and improvements. Effective management also requires knowledge of competitors' products, processes, and innovations in order to plan, evaluate, and place products and processes appropriately.

With technologies and production processes evolving rapidly, knowledge of available and emerging technologies, the new opportunities and product improvements they enable, as well as the costs of introducing them have become a key means for keeping businesses dominant, innovative, productive, and relevant in their specific industries. A business' knowledge of its own workforce, its capabilities, training needs, and grievances with management are all vital to maintaining the productivity of what is often the most expensive factor of production. Finally, knowledge of overall productivity is essential to business viability in a constantly changing and increasingly global business environment. Without

knowledge of their own productivity information, companies cannot make effective decisions on what products to introduce, discontinue, outsource, and innovate, or how to keep their management and workforce trained for necessary tasks and performing profitably.

Industrial knowledge management does not intrinsically demand ICT-based information and communication networks, but the large quantities of data and analysis to meet modern global business needs generally require decentralized data gathering that can be readily compiled and rolled up to management. Of the options available for such tasks, most businesses and managers find ICTs, the Internet, intranets, and similar technologies to be the most cost effective, particularly when businesses expect to operate on an international playing field.

As a result, the digital divide both within countries and between countries is not simply an issue of social equity, but also an issue of economic growth and international competitiveness, whether in agriculture, manufacturing, or services. For the Republic of Korea, the new global business environment linked by interlocking data networks calls for explicit industrial policy to accelerate the positive impacts of increased ICT use and to mitigate the potential downsides of information inequalities, gaps in skills training, and other transition effects. Fortunately, South Korea's industrial planners have both experience and skill in designing industrial policies, and many favorable policy steps have already been taken.

### **ICTs in the Republic of Korea's Economy**

The Republic of Korea saw tremendous growth in ICT sectors of the economy in the 1990s. In 1996, the telecommunications, computers, computer peripherals, and software services sectors of

the economy accounted for 8.1 percent of GDP. Four years later, this had grown by more than 60 percent to account for 13.0 percent of GDP in 2000. These figures are even more impressive when considering that such growth occurred during an overall economic expansion, so the absolute figures on growth are even higher. Moreover, the percentage of the workforce employed in these industries grew from 4.24% in 1995 to 6.04% in 2000, which suggests that although some concentration of wealth accrued to the ICT sector, most of the growth from ICT industries was distributed relatively evenly.

The ROK divides its ICT industries into three main sub-sectors: the telecommunications-services sector, the hardware and computer peripherals sector, and the software sector. Of these, the largest contribution to GDP comes from the IT equipment sector (about 75%), followed by telecommunications services (about 20%), and the software sector (5%). From 1997 to 2001, growth in all sectors has been driven both by exports and demands from domestic sources. In fact, growth in domestic ICT use and consumption outpaced export growth over the entire period, creating a helpful cushion of domestic demand for surviving the present industry shakeout.<sup>49</sup>

Semiconductors, especially DRAM computer memory, form the largest single component of the ROK's IT hardware sector. In fact, since 1998, South Korea has been the largest DRAM manufacturer worldwide, according to the Korea Association of Information and Telecommunication. The ROK's investments into cellular and mobile handset production have made South Korea the global leader in cellular hardware based on the CDMA standard. Two challenges confront the ROK on this account: the first is to

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<sup>49</sup>See Korea Association of Information and Telecommunication, "Information and Communication Industry Statistics Report 2000" (2000.12), data for 2000 based on "Research on the Trend of Major Information and Communication Items" (2001.2)

maintain this leadership as 3G mobile standards phase in worldwide; the second is to reduce dependence on foreign technology licensing and the resulting outflow of hard currency.

Although the absolute contribution of South Korea's software development sector is still fairly small, the ROK is rapidly establishing itself as significant player in software-development services and as a leader in computer animation. The Korea Association of Information and Telecommunication reports average annual growth rates of 30.6% and 49.5% respectively for the period 1996-2000.

Korea's emerging excellence in computer animation is traceable in part to domestic demand in computer gaming, which helps to build the essential skills base, and international demands for high quality animation at lower costs than achievable in Hollywood, New York, or Silicon Valley.

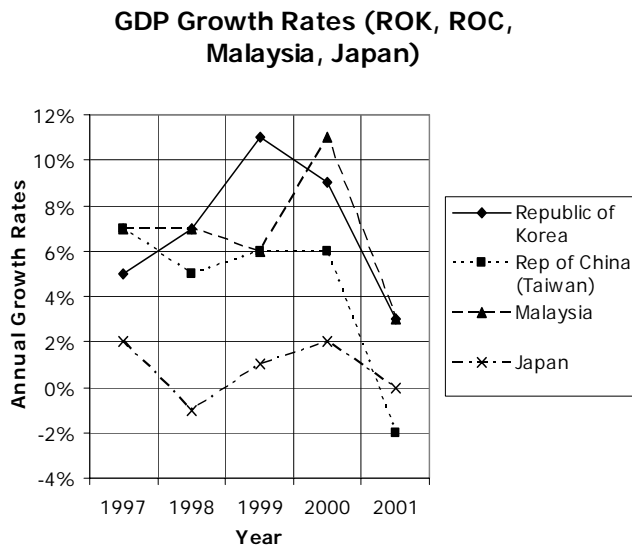
**Table 3.1. GDP Growth Rates 1997-2001: Korea, Malaysia, Japan**

<i>Country</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>
<b>Republic of Korea</b>	<b>5%</b>	<b>7%</b>	<b>11%</b>	<b>9%</b>	<b>3%</b>
Rep of China (Taiwan)	7%	5%	6%	6%	-2%
Malaysia	7%	7%	6%	11%	3%
Japan	2%	-1%	1%	2%	0%

Sources: *World Bank, World Development Indicators database (ROK, Malaysia, Japan) and Republic of China National Statistics ([www.stat.gov.tw](http://www.stat.gov.tw)) (Taiwan)*



**Figure 3.1. GDP Growth Rates (ROK, ROC, Malaysia, Japan) in 1997-2001**



South Korea's ICT industries were hit by the global slowdown in ICT industries that began in mid-2000, but the ROK did not suffer as badly as other major ICT exporters such as Taiwan, Malaysia, and Japan. South Korea could count on higher domestic demand for ICT products and services compared with Taiwan, a more established and diversified export base in comparison to Malaysia, and savings accumulated during the previous expansion, in contrast to Japan.

### **ICT Governance in the Republic of Korea**

South Korea's national government has played an active role in promoting ICT expansion in the economy and in government. In

1994, the government reorganized the Ministry of Communications into a new Ministry of Information and Communication and created the Office of Information Planning within MIC. Less than a year later, the Informatization [sic] Promotion Act of 1995 created an Informatization [sic] Promotion Council and introduced a number of other actions, most significantly mandating ICT action plans annually for each of the major sectors, including industry, education, culture, agriculture, and other. Planning for ICT is a critical step in effective ICT governance, because standards and processes adopted early on in computerization efforts have a tendency to constrain the choices available to meet additional needs later on. By these actions, the ROK demonstrated that already by 1994 it had identified the increasing importance of ICTs in both economic promotion and the delivery of government services.

Linking government ministries through inter-governmental networking systems was an early priority for the ROK. Among the electronic projects designed to smooth government were an electronic government document exchange system, a national financial management system, and an online government procurement system. Korea's National Computerization Agency estimates that these projects alone have saved over US\$ 400 million in government expenditures, as well as improved procurement time and reduced opportunities for corruption and graft.

In addition to inter-ministerial coordination at the national level, the ROK has also launched a number of electronic government initiatives for citizens and local government units. According to Suh Sam-young, president of the National Computerization Agency:

*By the end of [2002], 11 strategic initiatives are to be completed. The government e-service*

*center, social insurance service portal, a government-wide e-procurement system, Home Tax Service, national finance information system, integrated administrative information system of local governments, educational administrative information system, personnel policy management system, government e-document exchange, government e-Signature and e-Seal system, and government information system are the 11 priority projects expected to contributing the efficiency and transparency of government administration.*<sup>50</sup>

The goals of these initiatives, Suh states, are to create a digital government that a) better services its citizens, b) provides the best entrepreneurial climate for businesses, and c) secures transparency and efficiency of government administration.<sup>51</sup>

Local governments are also leveraging the human resources, high connectivity rates, and network features of ICTs to streamline processes and reduce opportunities for corruption in government procurement. Former mayor Goh Kun of Seoul instituted OPEN, for online procedures enhancement, a Web-based information system for civil applications, in which citizens can trace the status and conditions of their applications.<sup>52</sup> It was specifically designed not only to reduce costs and speed procurement, but also to make corruption and graft more difficult to execute. For example, procurement and service applications are handled and checked by at least two public servants, each of which face incentives to report

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<sup>50</sup> See Suh, Sam-young, "Korea's e-Government Finally at Hand." *The Korea Times* (12 November 2002), InfoTech section, CEO Forum. See also URL: [http://www.hankooki.com/kt\\_tech/200211/t2002111217234645110.htm](http://www.hankooki.com/kt_tech/200211/t2002111217234645110.htm)

<sup>51</sup> *Ibid.*

<sup>52</sup> See URL: <http://english.metro.seoul.kr/government/policies/anti/civilapplications/> for a description of OPEN on the Seoul city government website.

any malfeasance by the other. As a result of the electronic system, citizens seldom have reasons for direct audiences with bureaucrats, thus reducing the encounters most likely to result in bribes or graft. Matt Bonham, Jeffrey Seifert, and Stuart Thorson of Syracuse University's Maxwell School of Citizenship and Public affairs report that surveys indicate 84.3% of Seoul's citizens believe that OPEN has contributed to transparency and 72.3% say that it satisfies their interests.<sup>53</sup>

South Korea's attention to ICT governance is hardly limited to intergovernmental matters and streamlining its own services. As Mr. Suh mentions above, one of the key objectives is to promote ICT innovation and entrepreneurship to drive the ROK's economy. The main mechanisms to achieve this outcome were:

- Developing national broadband infrastructure to facilitate private e-services
- Government venture capital funds and loan programs
- Technical assistance for SMEs for IT planning and deployment

In the mid-1990s, government efforts to promote broadband accessibility were probably the most visible programs undertaken, and they have paid off well, as shown by South Korea's rank as the country with the highest rate of broadband penetration. In part, the ROK's success is attributable to its high urbanization rate and population density, meaning that Korea could offer broadband

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<sup>53</sup> Bonham, G. Matthew, Seifert, Jeffrey W., and Thorson, Stuart J., "The Transformational Potential of e-Government: The Role of Political Leadership," paper presented at the panel on Electronic Governance and Information Policy (Panel 9-1) at the 4th Pan European International Relations Conference of the European Consortium for Political Research. University of Kent, Canterbury, UK (9 September 2001). See also URL: <http://www.maxwell.syr.edu/maxpages/faculty/gmbonham/ecpr.htm>

services at a lower cost per user than many other countries, but the role of vision and political leadership in turning opportunity into reality should not be underestimated.

Serving low-density rural areas continues to be a challenge, even in relatively compact South Korea. In response, the ROK has developed a loan program to facilitate the deployment of fiber and wireless broadband options to rural areas, as well as to promote rural access points in post offices and local information centers.<sup>54</sup> The government recognizes that without these loans and subsidies, remote areas would likely be cut off from the benefits of Korea's networked economy and the existing digital divide would be exacerbated. Providing such loans may also have the benefit of reducing the cost of delivering government services to remote areas.

In the United States, much of the Internet boom of the late 1990s was fueled by large quantities of venture capital poured into creative ventures that identified ICT needs and developed services to meet them. Compared to the United States, venture capital for ICT activities in the ROK has been in shorter supply. During the bubble, venture capital rushed to US startups, but Korean companies had more difficulty emerging from the shadow of the Asian financial crisis of 1997-98. After the bubble burst, private venture capital for innovative startups dried up significantly. To compensate, the ROK created government-sponsored venture capital programs to encourage Korean entrepreneurs to innovate. In 1998 the ROK launched the MOST Fund I for venture capital with \$24 million in capital. A year later MOST Fund II was launched, with an additional \$33 million, as well as the Korea Venture Fund, with \$83 million destined to support ICT startups. In 1998, MIC also initiated an IT Investment Club to share

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<sup>54</sup> National Computerization Agency, "Broadband in Korea: Korea Information Infrastructure." Seoul, Korea. June 2002.

information and knowledge about Korean enterprises of potential interest to public and private venture funds. In 2002, noting that many companies needed to expand to the U.S. market to remain viable, MIC instituted a \$50M offshore venture capital fund to help list Korean companies on NASDAQ.

An early effort to promote ICT-oriented capital markets, the ROK established KOSDAQ in 1996 as an alternate exchange for new startup companies. Although KOSDAQ was hit hard only a year later during the Asian financial crisis, the volume of KOSDAQ presently exceeds that of the Korean Stock Exchange.<sup>55</sup>

Noting the importance of research and development to innovation and ICT competitiveness, the government used the tax code to stimulate increased research and development into ICTs, ICT use, and ICT product development. These included 50% tax deductions for R&D increases, a five percent deduction on pre-existing levels of expenditure, deduction of a special consumption tax on new products based on internal R&D, and the exemption of income tax on royalties from on-the-job inventions.<sup>56</sup>

In March 1999, the MIC announced its strategy document for an electronic Korea, called Cyber Korea 21.<sup>57</sup> The Cyber Korea 21 vision continues much of the emphasis on broadband building, governmental streamlining, and private sector promotion. It also increases attention to Korean capacity building, specifically setting

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<sup>55</sup> See: Sallmanns Insight, Asian Secondary Boards, April 2001. URL: [www.sallmanns.com/en/research/reports/0001.pdf](http://www.sallmanns.com/en/research/reports/0001.pdf)

<sup>56</sup> See American University, Management of Global Information Technology report: <http://www.american.edu/carmel/jw6194a/Korea.htm>

<sup>57</sup> Republic of Korea, Ministry of Information and Communications, "Cyber Korea 21: Korea's Vision for a Knowledge-Based Information Society." March 1999. A copy of the strategy document is available at: [http://www.innovazione.gov.it/eng/interevento/banda\\_larga/corea\\_cyber.htm](http://www.innovazione.gov.it/eng/interevento/banda_larga/corea_cyber.htm)

a goal of “Making Koreans the Best Computer Users in the World” and targeting success by reforming the educational curriculum to include extensive computer instruction and computer use, re-emphasizing access methods models and connectivity for underserved areas. Cyber Korea 21 further identifies key legal reforms needed to ensure the viability of e-commerce and e-government, including copyright protection, electronic signature legislation, and the creation of a customer report center site to report privacy infringement and digital rights abuse.

South Korea’s planners and advisors have paid attention to a number of “soft issues” in their strategy for Cyber Korea 21. Some of these efforts have already been discussed, such as attention to rural and underserved areas, the development of legal frameworks for electronic signatures, and feedback sites that are accessible information centers and post offices. Groups with special needs, such as the disabled, elderly, homemakers, etc., have not been forgotten in the rush to create a wired or e-Korea. The implementation of Cyber Korea targets these communities through three directives, including:

- Enhancing ICT literacy for groups with special needs
- Supporting technology for the disabled and elderly
- Ensuring access to information via community access centers, etc.

It is still too early to make a final evaluation of the effectiveness of these efforts, and much will depend on how quickly the global economy recovers from the present slowdown, but most observers appear to agree that South Korea’s plans are ambitious, achievable, and appropriate for a country that aspires to promote effective economic structures for what they hope will be “the best Internet users in the world.”

## **Final Considerations and the Future of ICTs in the ROK**

The Republic of Korea presents the world with an example of extremely successful economic promotion in the ICT sector. Although the current slowdown and consolidation in ICT industries has affected South Korea as well, many of the investments that Korean businesses, citizens, and government agencies have made will continue to produce benefits and dividends for society. The economic downturn in the ICT sectors has not meant the end of the Internet or fundamental changes in the way governments, businesses, and citizens all interact. Broadband capacity, human capacity building, and service development will continue to be critical to South Korean competitiveness in an increasingly globalizing world economy.

South Korea has had several factors working in its favor as a major ICT power: a sizeable population, high urbanization, income levels and distribution, extremely high literacy rates, and pre-existing engagement in export promotion strategies. These have all set the stage for successful ICT industrial policy and support from both economic and social factors. As important as these factors are, they would all amount to little without pro-active involvement from Republic of Korea's political leadership to ensure that appropriate planning, infrastructure, and human capacity building capitalize on these strengths.

Could South Korea serve as a model for other developing countries seeking to grow through ICT industries? India and Brazil also show the value of a literate and educated population to developing industries in software and multimedia development, but the large income disparities of these countries have made it difficult to spread the advantages of ICT development beyond a small elite sector of their societies. Korea's sizable domestic market for ICT



services proved to be a critical cushion for the industry during the industry slowdown.

For extremely low-income countries such as much of sub-Saharan Africa, the Middle East, and Central America, it is hard to see how the lessons of the Korean experience can be readily applied and localized. For middle income countries, the potential is larger, particularly if they are highly urbanized, as are several parts of Asia.

An intriguing opportunity suggests itself as the global economy tries to dig its way out of the present ICT slowdown. Many hardware and software companies are predicting that the largest growth areas for hardware and software services will be in the developing areas of the world, where five billion or more people remain more or less untouched by the digital revolution. The computing models, software, and equipment needs of these people are likely to be significantly different (e.g. smaller, cheaper, power-efficient, wireless) from those employed by the present one half to one billion, but will probably involve platforms in which the Republic of Korea already finds itself advanced (e.g. smart-phones, cellular phones, set-top boxes). As international donor assistance organizations move to models of “south→south” assistance, there is a potential niche where South Korea could involve itself to keep on the cutting edge of technology uses and capture an emerging market.

Indeed, one is hard pressed to decide if the Republic of Korea should or should not be categorized as a developing country. Perhaps the opportunity for South Korea to become a future source of ICT technical assistance to other developing countries is as much a sign of “graduation” as is its entry into the OECD and it’s

position as “number one” in world broadband penetration for its citizens.

